

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Improvements in or relating to Electrical Apparatus

- We, THE GENERAL ELECTRIC COMPANY LIMITED, of 1 Stanhope Gate, London, W.1., a British Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to electrical apparatus.
- Electrical apparatus, for example of the type used in electronic telephone exchanges, is commonly supported on a rack framework with the individual components of the apparatus mounted on rectangular panels which are arranged side by side on the shelves of the rack. The panels are usually slidably supported, so as to lie in vertical planes, between upper and lower guides which are attached to the shelves, and the electrical connections to the components mounted on the panels are made by way of plug and socket connectors located at the rear of the panels, so that the panels may be readily withdrawn from the front of the rack.
- It is an object of the present invention to provide an improved component mounting panel for use in such electrical apparatus.
- According to the present invention a component-mounting panel for use in electrical apparatus comprises a front member, a rear member, a pair of elongated channel members each of which has in the channel therein an inwardly projecting portion extending the length thereof, the four members being secured together to form a plane quadrilateral frame in which the channel members lie parallel to one another, and a connector which is secured to the rear member by means of which electrical connections may be made to components mounted on the panel, said components or assemblies thereof being mounted on or carried by structures or members each of which structures or members lies partially within one or both of the channel members of the frame so as to be held captive therein, the components or assemblies thereof being secured to or supported by those parts of the structures or members that lie outside the channel members, the channel members serving as runners which are adapted to run in guides of the apparatus to enable the panel to be inserted or removed.
- Preferably the channels in the channel members are arranged to face one another. The front member may be provided with one or more test sockets, and may be shaped to provide a handle, by means of which the panel may be withdrawn from its mountings. The connector secured to said rear member may be an edge-type plug connector, which is arranged to cooperate with a socket connector mounted independently of the panel.
- Electrical apparatus in accordance with the present invention will now be described by way of example with reference to the accompanying drawings, of which:
- Figure 1 shows the front elevation of a rack of electrical apparatus including shelves bearing component mounting panels,
- Figure 2 shows a side elevation of the apparatus of Figure 1,
- Figure 3 shows a perspective view of one of the shelves shown in Figure 1,
- Figure 4 and 5 show details of the structure of the shelves shown in Figure 1,
- Figure 6 shows a perspective view of one of the component mounting panels of Figure 1,
- Figures 7, 8 and 9 show in perspective parts of the apparatus which may be used in
- [Price 4s. 6d.]

association with the component mounting frame shown in Figure 7 and

Figure 10 shows a perspective view of a part of one of the shelves of Figure 1.

5 Referring to Figures 1 and 2, the apparatus has a rack structure which comprises a base 1, a pair of rectangular-box section uprights 2, which at their lower ends are secured to the base 1 and at their upper ends are bridged by a pair of angle section cross bars 3, and a plurality of horizontal shelves 4, of which only four are shown, which extend between the uprights 2 and on each of which a plurality of component mounting panels 5 may be supported.

10 Referring also to Figures 3, 4 and 5, each of the shelves 4 comprises a pair of rectangular end plates 6 which are secured at the same level one against the inner face of each of the uprights 2, these end plates 6 being secured by means of angle brackets 7 in a generally vertical plane with their longer edges horizontal. The floor and the top of each shelf 4 are each formed by two or more channel section cross members 8 and 9 respectively which extend parallel to one another between the end plates 6 at spaced positions adjacent the lower and upper edges thereof respectively, the number of cross members 8 which are used to form the floor of the shelf 6 being determined by the weight of the components which the shelf 6 has to support.

35 The face of each of the cross members 8 and 9 which forms the base of the channel section is provided with a single row of regularly-spaced transverse slots 10 which extends centrally along the length of the face. In addition the free longitudinal edges of the lower channel members 8, which are of almost-closed-box section, are provided with notches 11 opposite the slots 10 in the member 8. The upper cross members 9 are secured to the end plates 6 by means of L-section brackets 12 one end of each of which rests in one of the slots 10 in the respective cross-member 9 while the other bears against the inner face of the end plate 6. The lower cross members 8 are secured to the end plates 6 by means of plate members 13 each of which rests in one of the slots 10 in the respective cross member 8 and in the notches 11 corresponding to that slot 10. Each end plate 6 is provided with inward-facing flanges 14 along its upper and lower edges, the sections of these flanges 14 are cut and bent into the channels in the cross members 8 and 9.

60 The electrical components which are supported on a shelf 4 are mounted on the component mounting panels 5 which, in the assembled apparatus lie side by side between the end plates 6 of the shelf 4. The panels 5 are arranged to be slidably mounted in

channel-section guides 15 which are arranged in pairs, one of each pair being attached to the upper cross members 9 and the other being attached to the lower cross members 8, these guides 15 lying one vertically above the other and extending generally at right angles to the cross members 8 and 9. The guides 15 are each located with respect to the cross members 8 or 9 by means of a lug 16 adjacent the front end of the guide 15 which extends at right angles to the length of the guide 15 and which passes through one of the slots 10 in one of the cross members 8 or 9. At the rear end of each pair of guides is mounted an edge-type socket 17, by means of which electrical connections may be made to a panel 5 which is mounted in the guides 15. This socket 17, which extends between an upper cross member 9 and a lower cross member 8 and which is located with respect to these cross members 8 and 9 by means of lugs 18 extending from either end of the body of the socket 17 which passes through slots 10 in the members 8 and 9, may be of the type described in Patent Application No. 21,487/64 (Serial No. 1,034,236). The rear end of each of the pair of guides 15 associated with a socket 17 lies between the respective end of the socket body and the adjacent cross member 8 or 9 with one of the lugs 18 on the socket body extending through a slot 19 in the end of the guide 15 into one of the slots 10 in the cross member 8 or 9.

Referring now to Figure 6, the component mounting panels 5 each comprise a front member 20, a rear member 21 and upper and lower channel members 22, which four members are secured together to form a rectangular framework. The upper and lower channel members 22 are each of the form of a rectangular-section tube having a slot 23 through the centre of one wall thereof which extends throughout the length of the member 22. The members 22 may alternatively be considered as having T-section channels extending along their lengths. In the assembled panel the slotted wall of each channel member 22 is arranged to face the other channel member 22.

The front member 20, which forms a part of the front surface of the apparatus, carries an electrical socket 24 having a plurality of contacts 25 which may be used as test points, and is provided with a handle portion 26 near its upper end to facilitate handling of the panel 5. The rear member 21 carries a printed circuit plug 27 which is arranged to cooperate with a corresponding shelf-mounted socket 17 when the panel 5 is in position on a shelf 4. The plug 27 is detachably secured in a slot in the rear-member 21 by means of clips 28, and the rear member 21 is provided with a pair of metal plates 29 which lie parallel to and one on



either side of the printed circuit plug 27 to act as shrouds.

Referring also to Figure 7, those parts of the apparatus which make use of printed circuit boards are attached to the channel members 22 of their respective panels 5 by means of holders 30 moulded from an insulating material such as nylon. These holders 30 are each of the shape of an elongated rectangular block having along one major face a projecting portion 31 which is shaped to fit closely the interior of the channel members 22. A holder 30 is fitted by inserting its projecting portion 31 into the channel in a channel member 22 from one end and then sliding it to the required position along the channel member 22. The major face of the holder which lies opposite the projecting portion 31 is provided with a longitudinal slot 32 and a plurality of transverse slots 33, which extend from the longitudinal slot 32 to one edge of the face. These slots 32 and 33 are slightly narrower at the top than at the bottom so as to grip the edge of a printed circuit board 34, which may be mounted either in the longitudinal slot 32 so as to lie in the same plane as the frame of the panel 5, or, as shown in Figure 7, in one of the transverse slots 33 so as to lie in a plane generally at right angles to the plane of the panel 5.

Each holder 30 may have an integrally moulded cable cleat 35 extending from a third major face thereof, which may serve to support leads interconnecting components on the panel 5 or leads connecting components to the plug 27 carried by the rear member 21 or to the test socket 24 carried by the front member 20.

Referring to Figure 8, components which are not adapted to mounting on printed circuit boards may be mounted on sub-frames 36 which are attached to the channel members 22 of the respective panel 5 by means of lugs 37 projecting from the sub-frames, or by means of brackets 38 of the type shown in Figure 9, which are shaped to fit within the channels in the channel members 22. A pair of panel frames may be arranged to share a common front member 20, so that sub-frames 36 may then be supported between the two panel frames. The members 20, 21 and 22 of each panel are secured together by means of tapped bars 39, or suitable nuts (not shown) which lie within the channels in the channel members 22 at either end thereof and to which the front and rear members 20 and 21 respectively are bolted. The brackets 38 which project from the sub-frames 36 may be secured within the channel members 22 by bolts 40 passing through the slotted walls of the channel members 22, and a moulded holder 30, or a plurality of holders 30 placed end-to-end, may be held in the required position in a channel

member 22 by means of nuts or tapped bars 39 secured within the channel member 22 one at either end of the holder 30 or plurality of holders 30. The lugs 37, brackets 38 and holders 30 required on a particular panel 5 are inserted in the required order from, say, the rear ends of the channel members 22 of that frame before the rear member 21 is bolted in place.

Referring now to Figures 3 and 10, component mounting panels 5 are retained in position on a shelf 4 by means of a locking bar 41, which extends between the end plates 6 of the shelf 4 so as to lie adjacent the lower ends of the front members 20 of the panels 5. The locking bar 41, which is of generally rectangular cross-section is pivoted at either end on eccentrically placed pins 42 which rest in sockets 43 in the end plates 6. The socket 43 in one of the end plates 6 is shaped like a keyhole, and the pins 42 are of rectangular cross-section such that, in two positions spaced 180 degrees apart, the one pin, and hence the bar, fall under gravity into a position in which the bar 41 is prevented from rotating.

In one of the two positions mentioned above, the "locked" position, the locking bar 41 lies partly in front of the lower edges of the front members 20 of the panels 5 on the shelf 4, so preventing the withdrawal of these panels 5. However, by lifting that end of the locking bar 41 whose pivot pin 42 rests in the keyhole-shaped socket 43 the locking bar 41 may be rotated outwards to the second position, the "unlocked" position, where, due to the eccentric placing of the pins 42 with respect to the longitudinal axis of the bar 41, the bar 41 no longer lies partly in front of the front members 20 of the panels 5, so that the panels 5 may then be withdrawn from the shelf 4.

The pivot pins 42 project from a longitudinally extending rectangular section hole 44 in the locking bar 41, in which each pin 42 lies alongside the centre portion 46 of a Z shaped retaining member 45. The end 47 of the retaining member 45 bears against the end of the bar 41, while the pin 42 is urged out of the hole 44 by a spring 49 in compression between the inner end of the pin 42 and the end 48 of the retaining member 45.

In an alternative form (not shown) the pins 42 are of generally circular cross section with an end of each pin 42 being provided with a pair of flats which cooperate with the slot of the keyhole socket 43 to lock the bar 41 in position. These circular section pins 42 are maintained in corresponding circular section holes in the bar 41 by means of grub screws.

The faces of the locking bar 41 may be used for labelling. For example, the outer face 50 of the bar 41 when it is in the locked position may carry in a dovetail re-

cess 51 therein, the designations (for example "Ring Counter", "Gating Unit" or "Reed Relay Matrix") of the adjacent panels 5, while the outer face 52 of the bar 41 when it is in the unlocked position may carry, in a dovetail recess 53 therein, the type number of each adjacent panel 5 (possibly with the panel designation) and/or the numbers of the appropriate panel drawings to assist in repair or replacement of panels 5, and may also carry a colour coded mark (not shown) in respect of each adjacent panel 5 which is repeated on that part of the front member 20 of the respective panel 5 which is covered by the bar 41 when it is in its locked condition. The remaining faces of the bar may carry additional designations.

A slot 54 which communicates with the hole 44 extends along the length of the recess 51 in the face 50 of the bar 41. The bar 41 may be an extruded light alloy section.

Certain of the features described above form the subject of copending Patent Application No. 37,473/64 Serial 1065157.

#### WHAT WE CLAIM IS:—

1. A component-mounting panel for use in electrical apparatus comprising a front member, a rear member, a pair of elongated channel members each of which has in the channel therein an inwardly projecting portion, extending the length thereof, the four members being secured together to form a plane quadrilateral frame in which the channel members lies parallel to one another, and a connector which is secured to the rear member by means of which electrical connections may be made to components mounted on the panel, said components or assemblies thereof being mounted on or carried by structures or members each of which structures or members lies partially within one or both of the channel members of the frame so as to be held captive therein, the components or assemblies thereof being secured to or supported by those parts of the structures or members that lie outside the channel members, the channel members serving as runners which are adapted to run in guides of the apparatus to enable the panel to be inserted or removed.

2. A component mounting panel in accordance with Claim 1 wherein the channel members are each of the form of a rectangular section tube having a slot through the centre of one wall thereof, which slot extends throughout the length of said member.

3. A component mounting panel in accordance with Claim 1 or Claim 2 wherein the channels in the channel members are arranged to face one another.

4. A component mounting panel in accordance with Claim 1, Claim 2 or Claim 3 wherein a structure on which one or more components are mounted has two parts which lies respectively in the two channels.

5. A component mounting panel in accordance with Claim 1, Claim 2, Claim 3 or Claim 4 wherein a printed circuit board is held between two like members parts of which are held captive respectively in the two channels.

6. A component mounting panel in accordance with Claim 5 wherein said printed circuit board is held in slots in said like members so as to lie generally in a plane parallel to the plane of the panel.

7. A component mounting panel in accordance with Claim 5 wherein said printed circuit board is held in slots in said like members so as to lie generally in a plane perpendicular to the plane of the panel.

8. A component mounting panel in accordance with Claim 5, Claim 6 or Claim 7 wherein said two like members are provided with cable clips for supporting connecting leads.

9. A component mounting panel in accordance with any preceding claim wherein at least one of the structures or members is provided with a screw whereby said structure or member may be clamped against longitudinal movement with respect to the channel members.

10. A component mounting panel in accordance with any preceding claim wherein the front member is provided with one or more test sockets whereby electrical connections may be made to a circuit or circuits carried by the panel.

11. A component mounting panel in accordance with any preceding claim wherein the front member is shaped to provide a handle by means of which the panel may be withdrawn from its mountings.

12. A component mounting panel in accordance with any preceding claim wherein the connector secured to the rear member is an edge-type plug connector, which is arranged to cooperate with a socket connector mounted independently of the panel.

13. A component mounting panel substantially as hereinbefore described with reference to Figure 6 of the accompanying drawings.

14. Electrical apparatus substantially as hereinbefore described with reference to Figures 3 to 6 and one or more of Figures 7, 8 and 9 of the accompanying drawings.

For the Applicants,  
J. D. DOLWIN,  
Chartered Patent Agent.

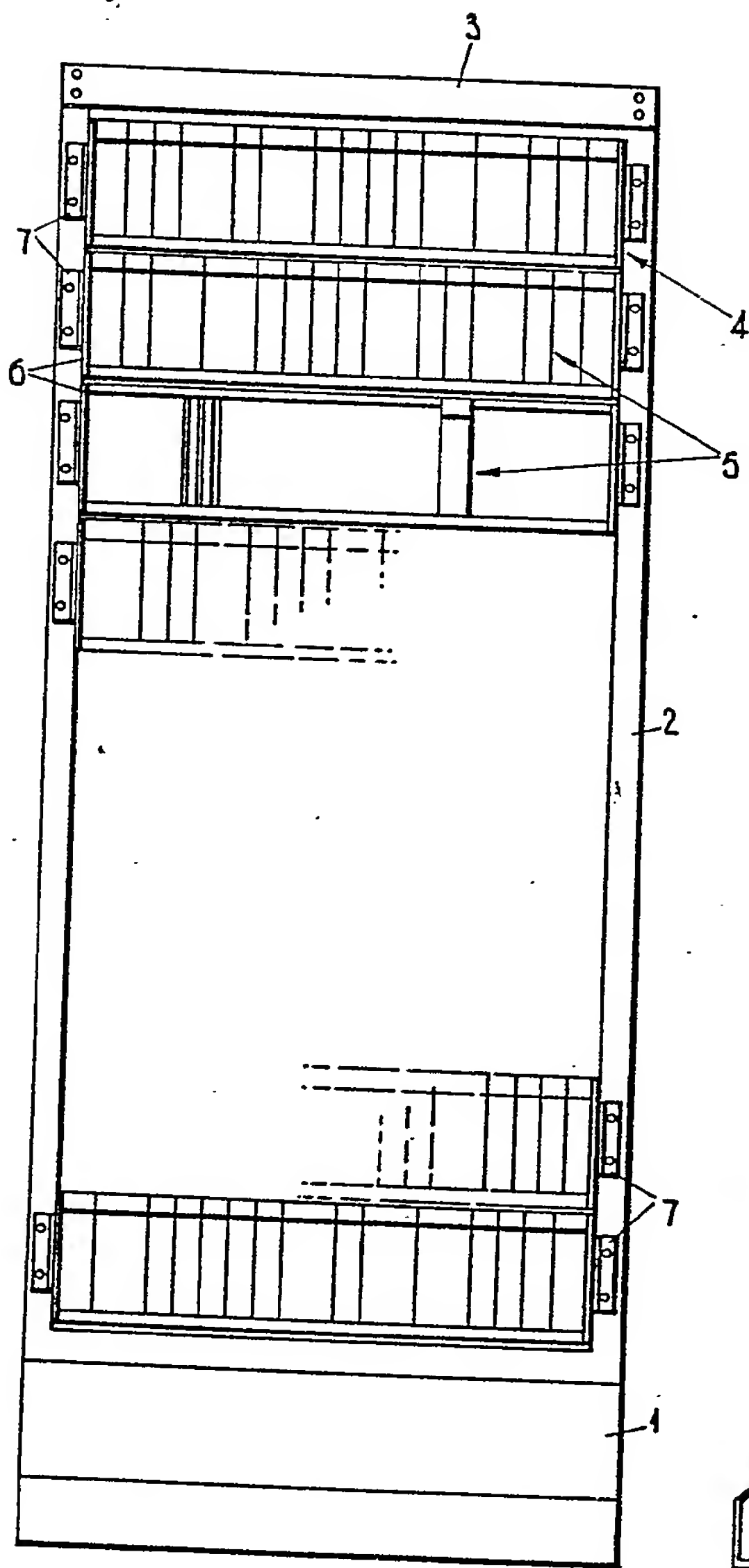


Fig. 1

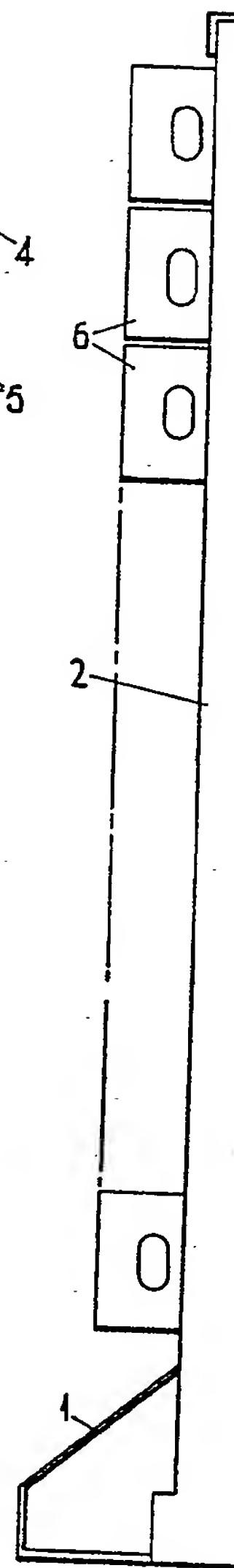


Fig. 2

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COMPLETE SPECIFICATION

4 SHEETS

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Sheets 1 & 2

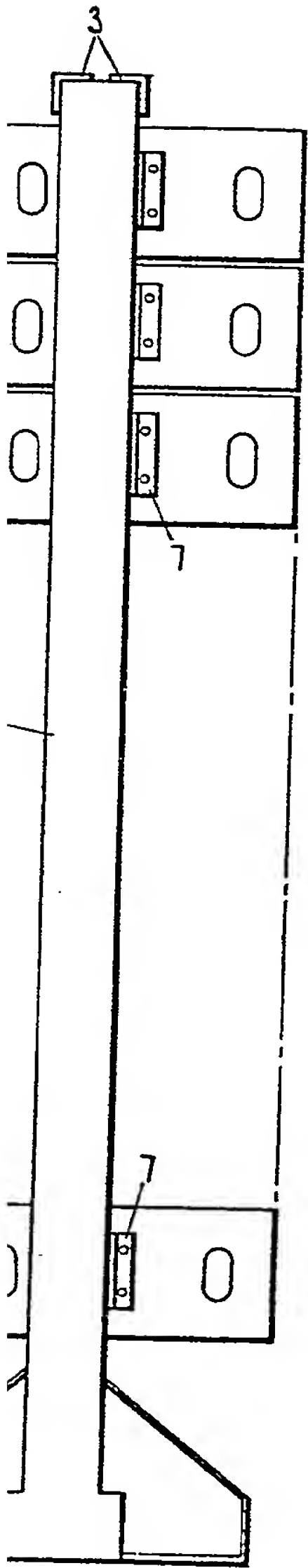


Fig. 2

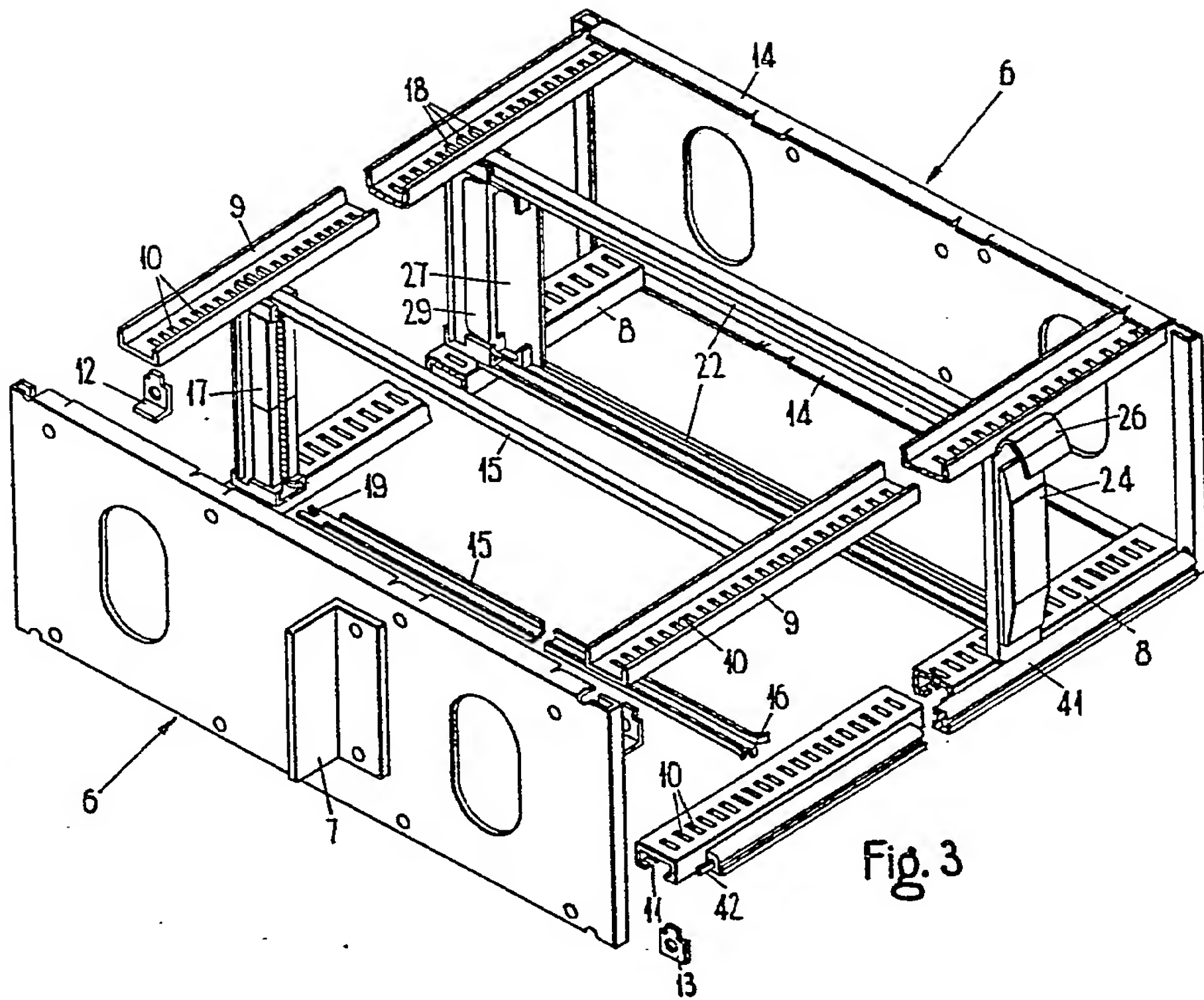


Fig. 3

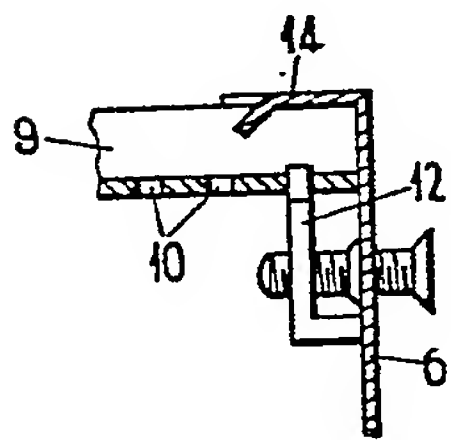


Fig. 4

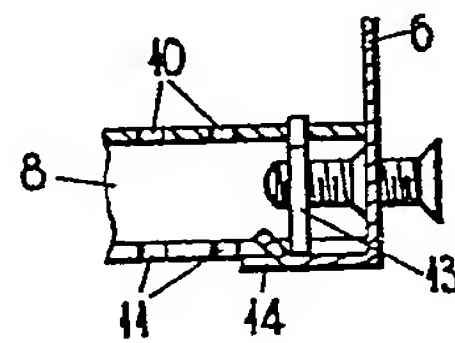
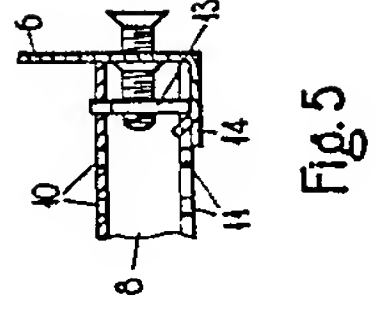
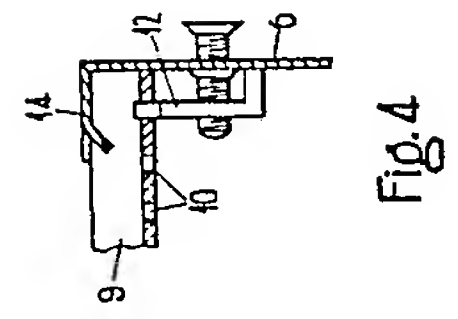
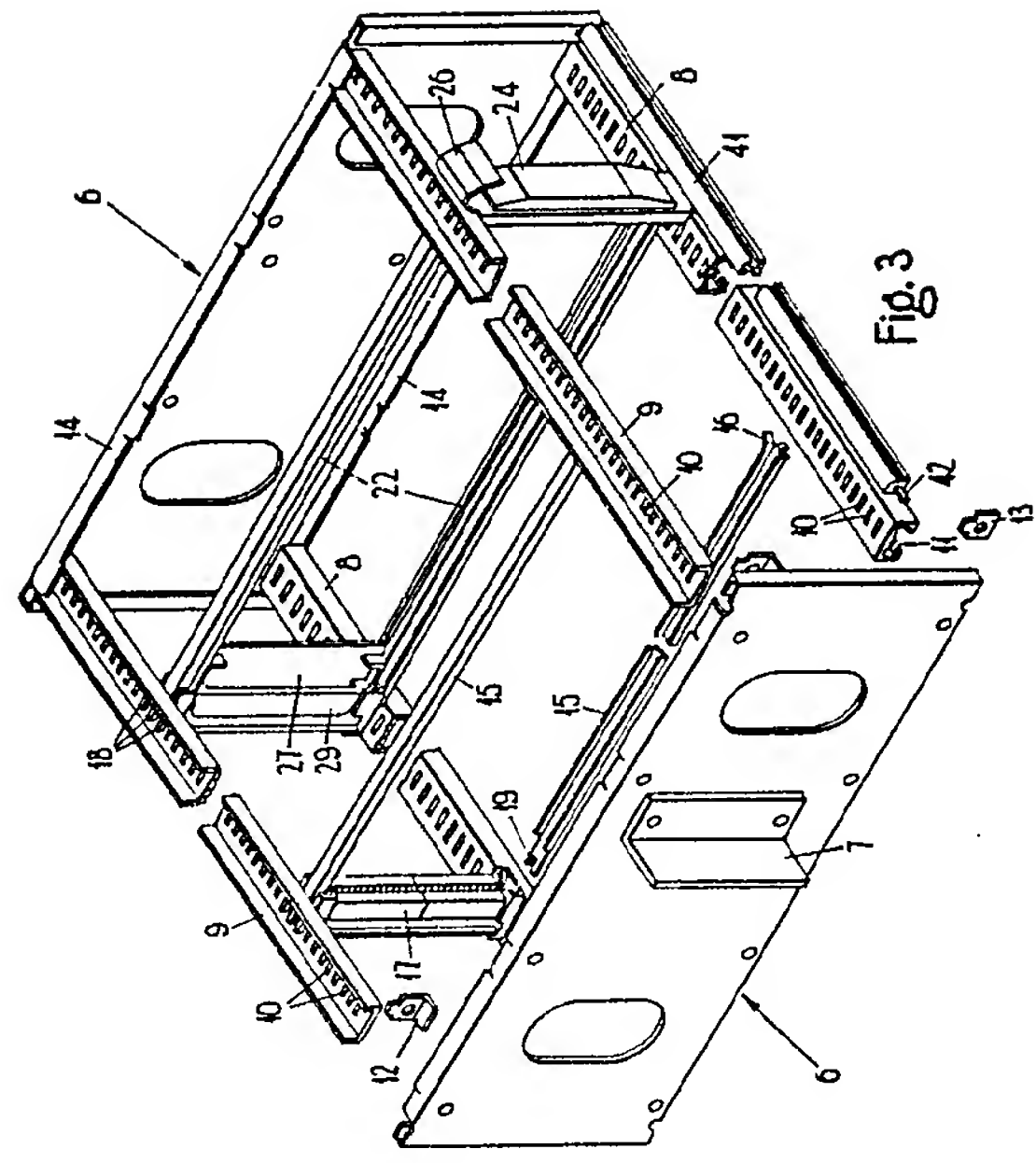
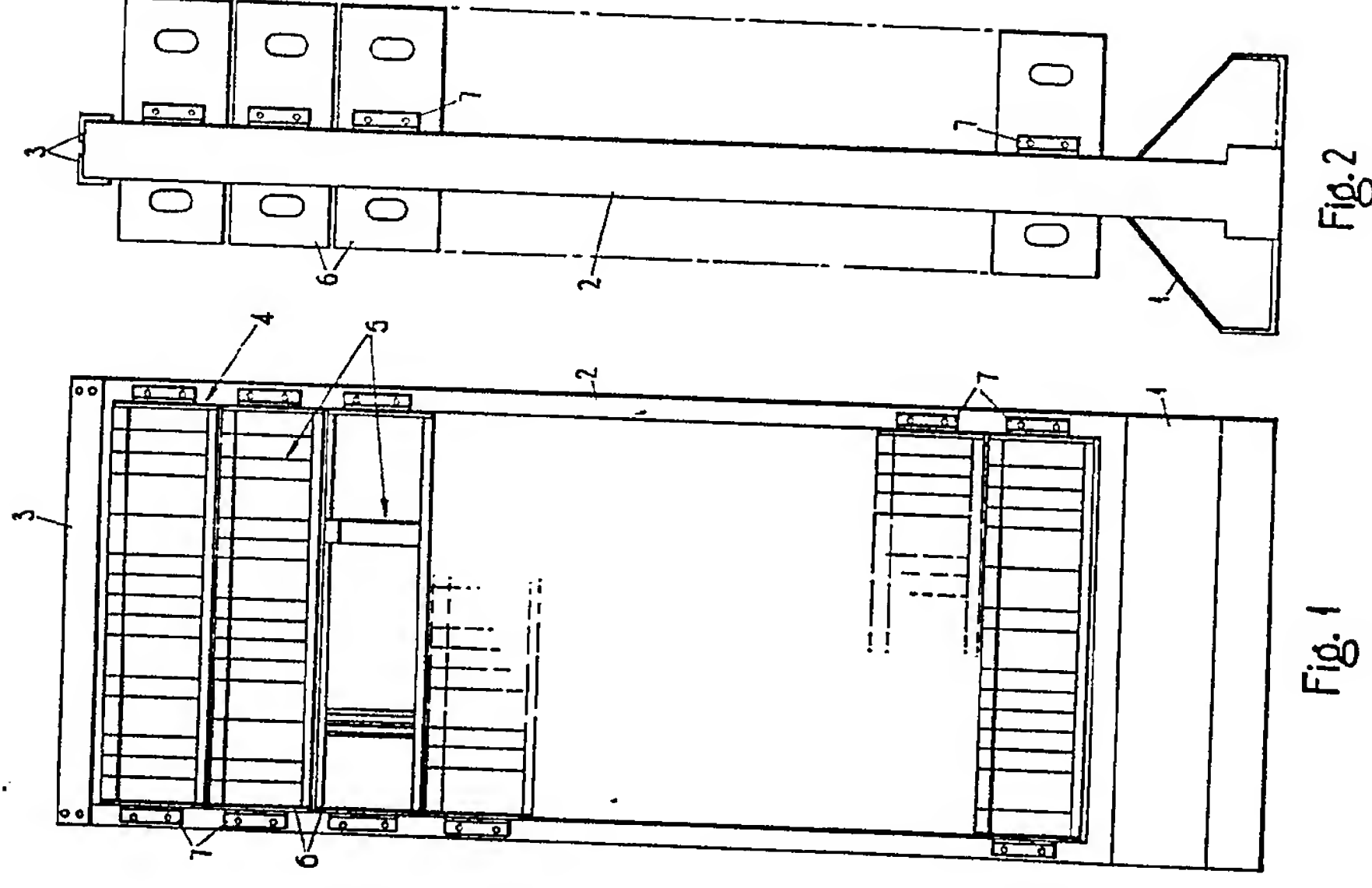


Fig. 5





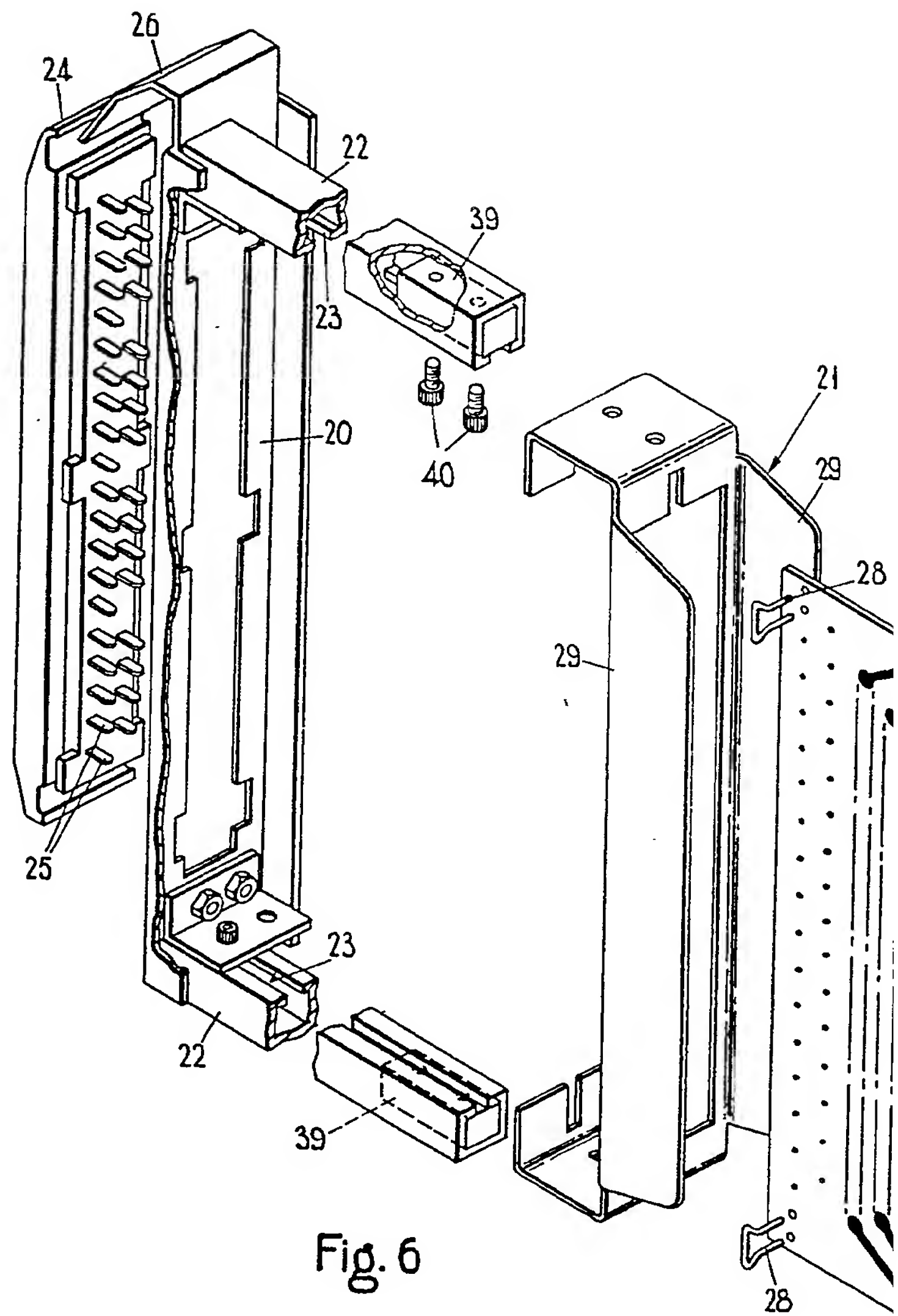


Fig. 6

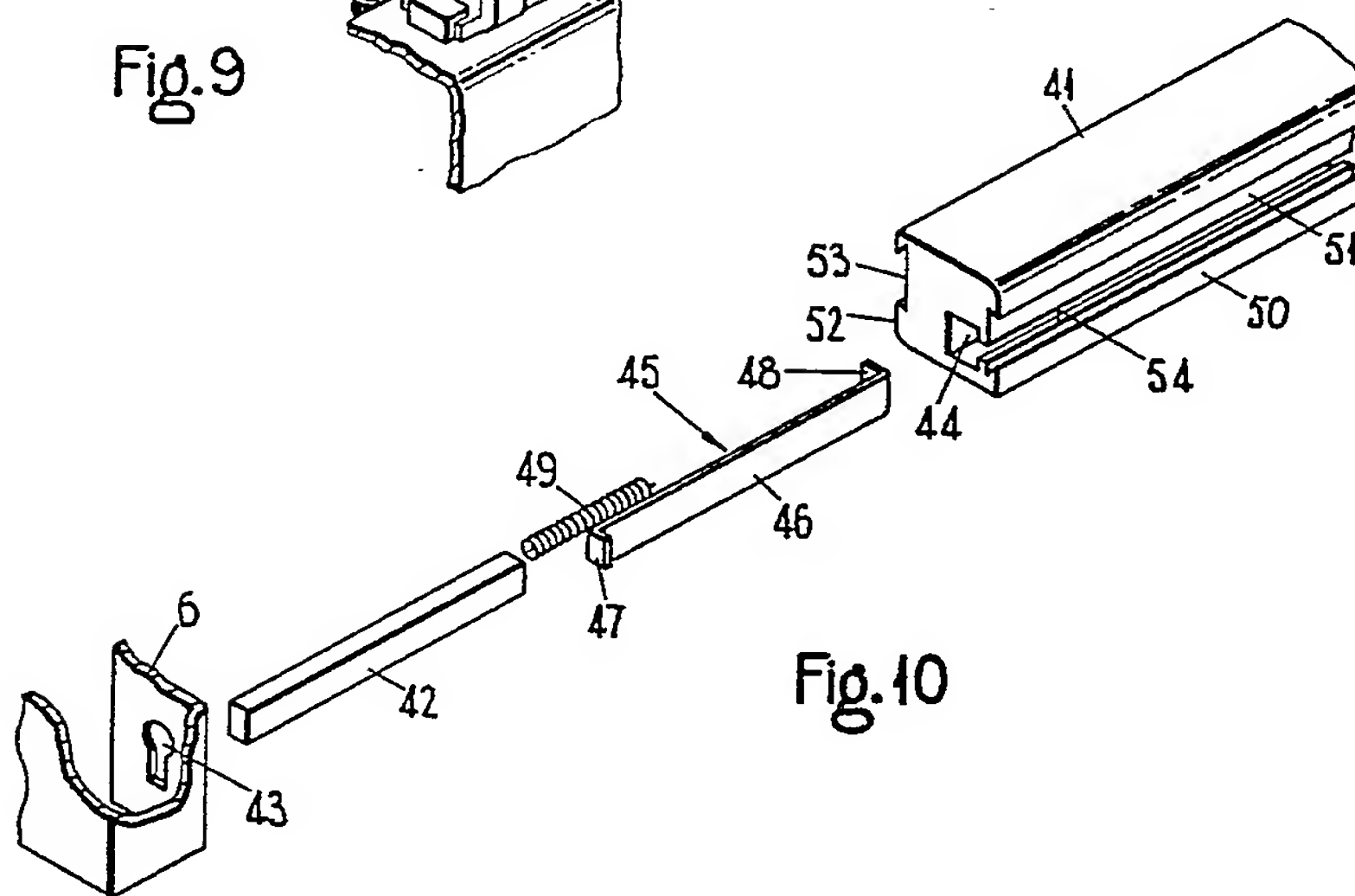
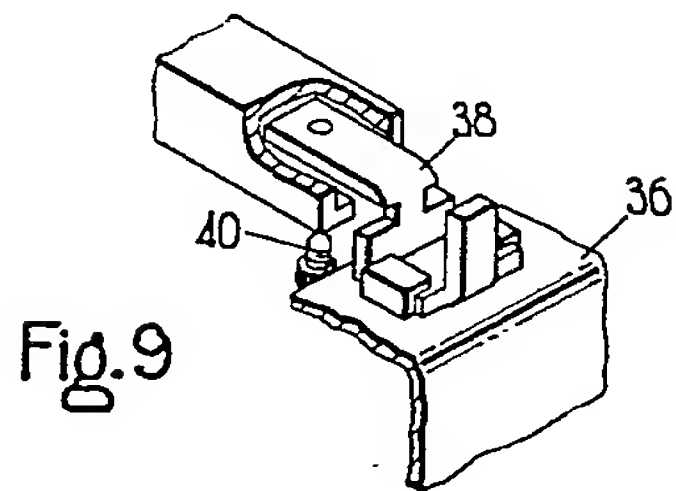
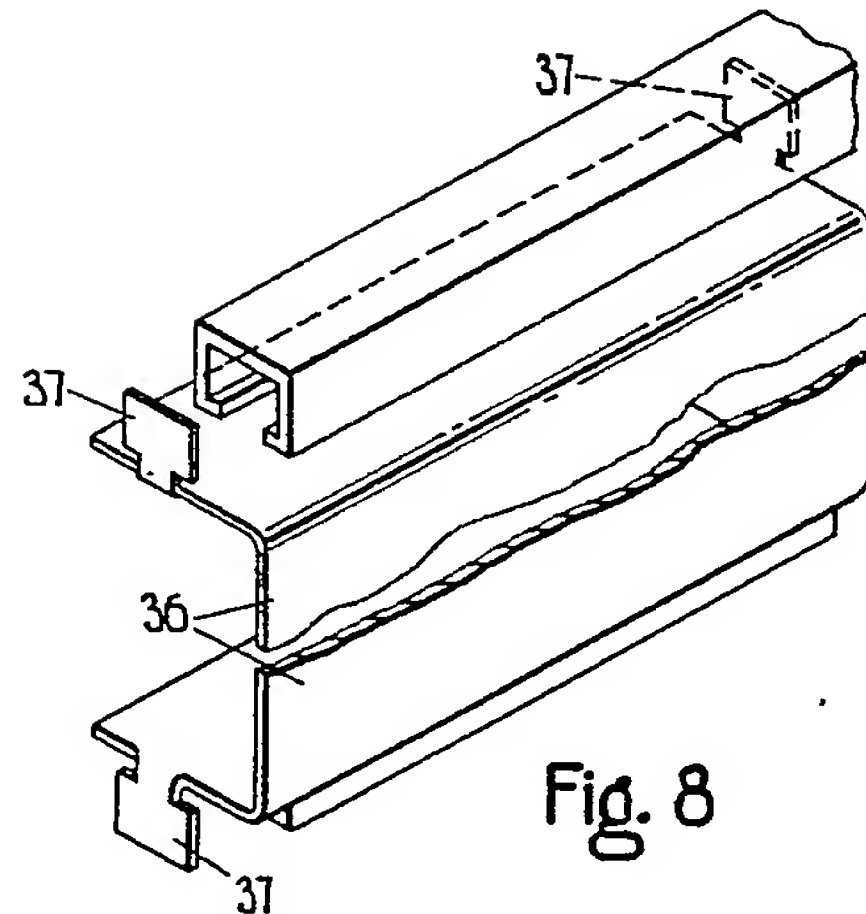
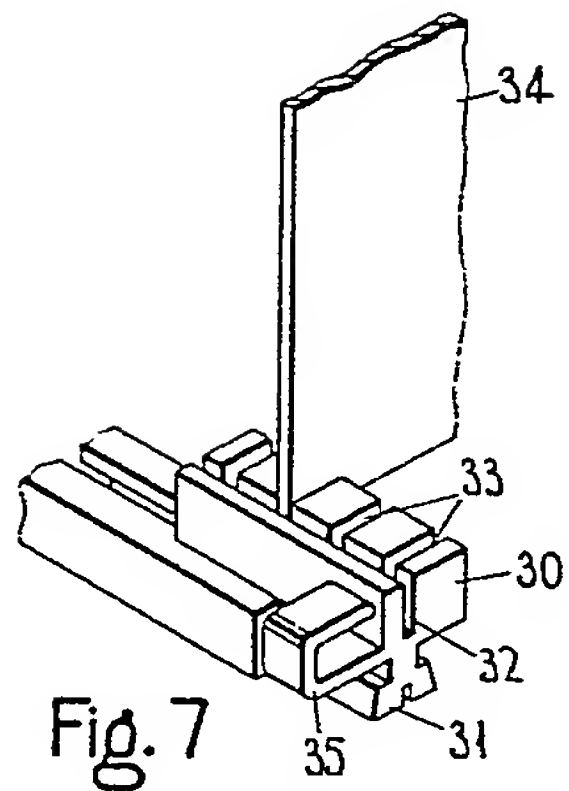
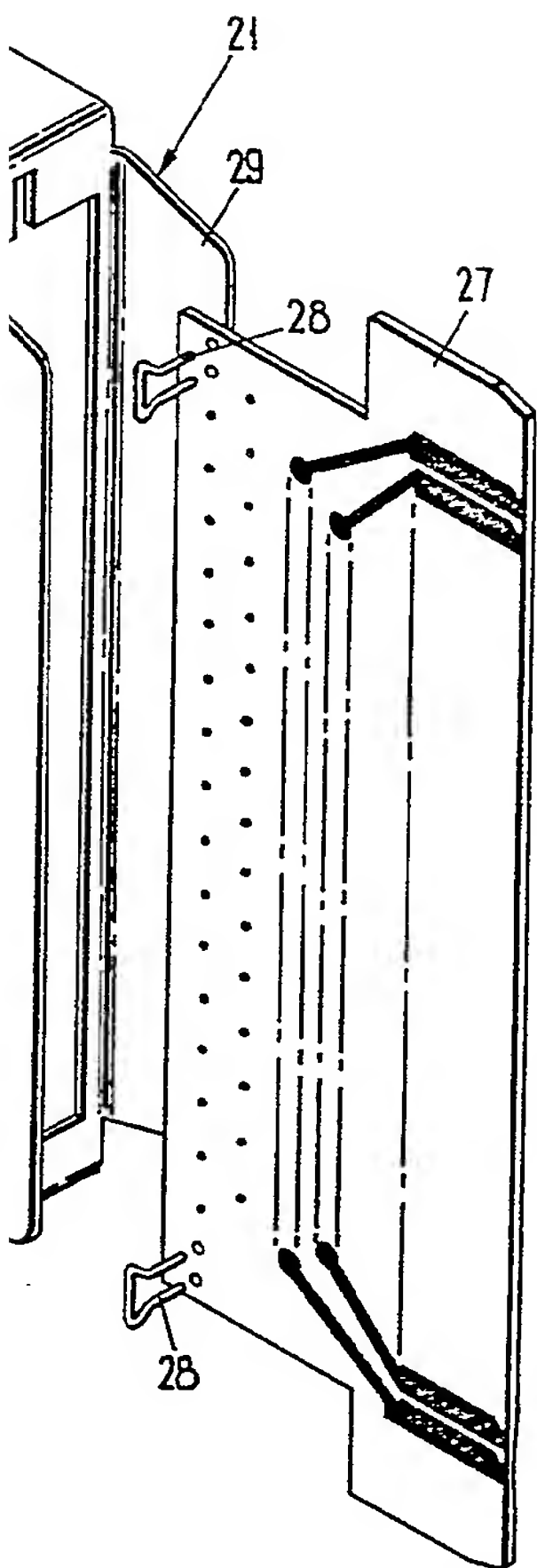


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COMPLETE SPECIFICATION

4 SHEETS

*This drawing is a reproduction of the Original on a reduced scale*  
Sheets 3 & 4



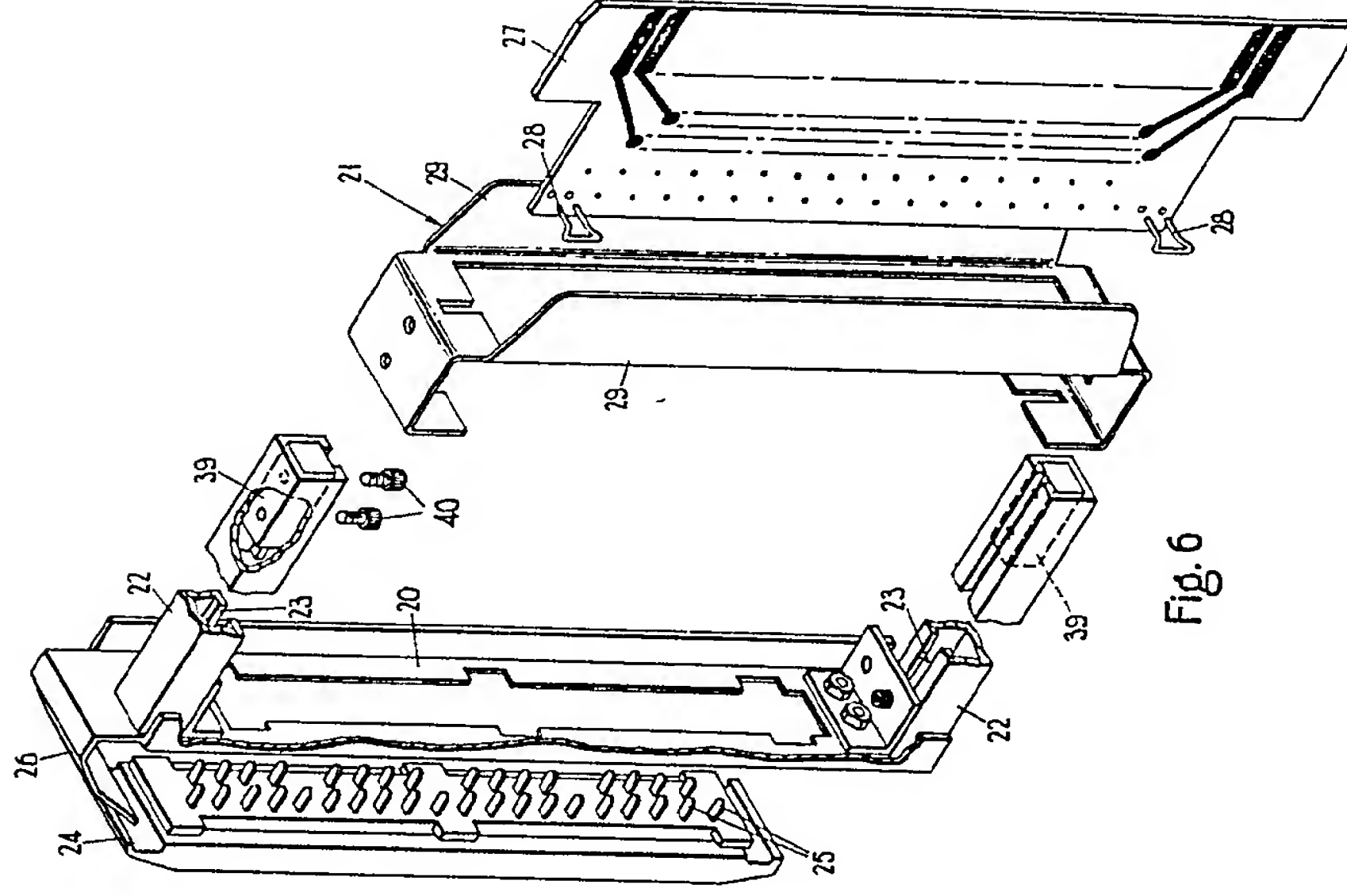


Fig. 6

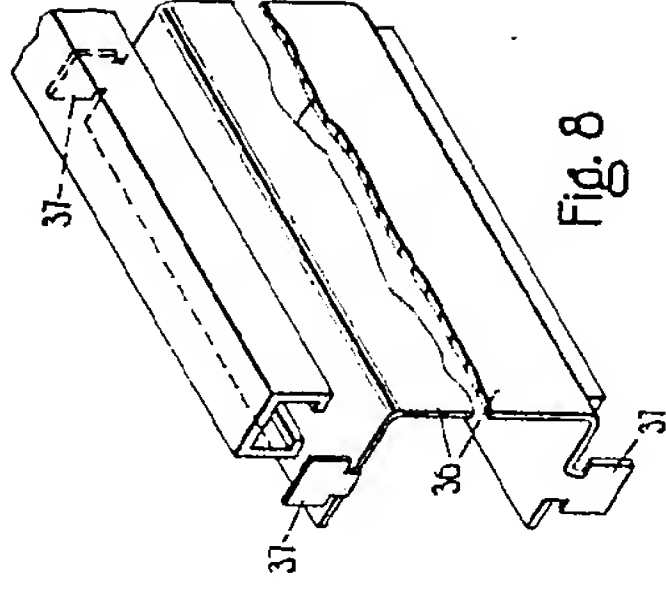


Fig. 8

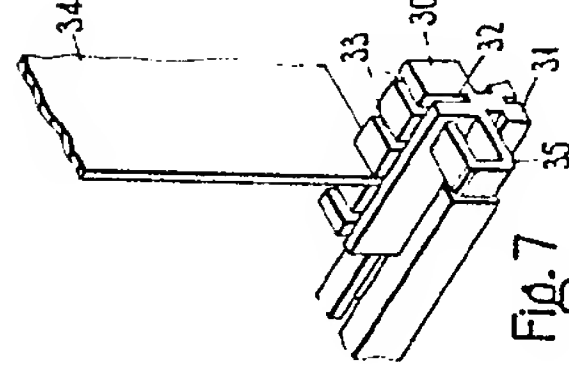


Fig. 7

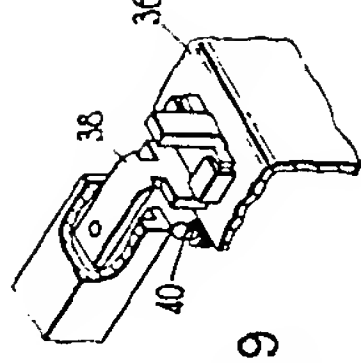


Fig. 9

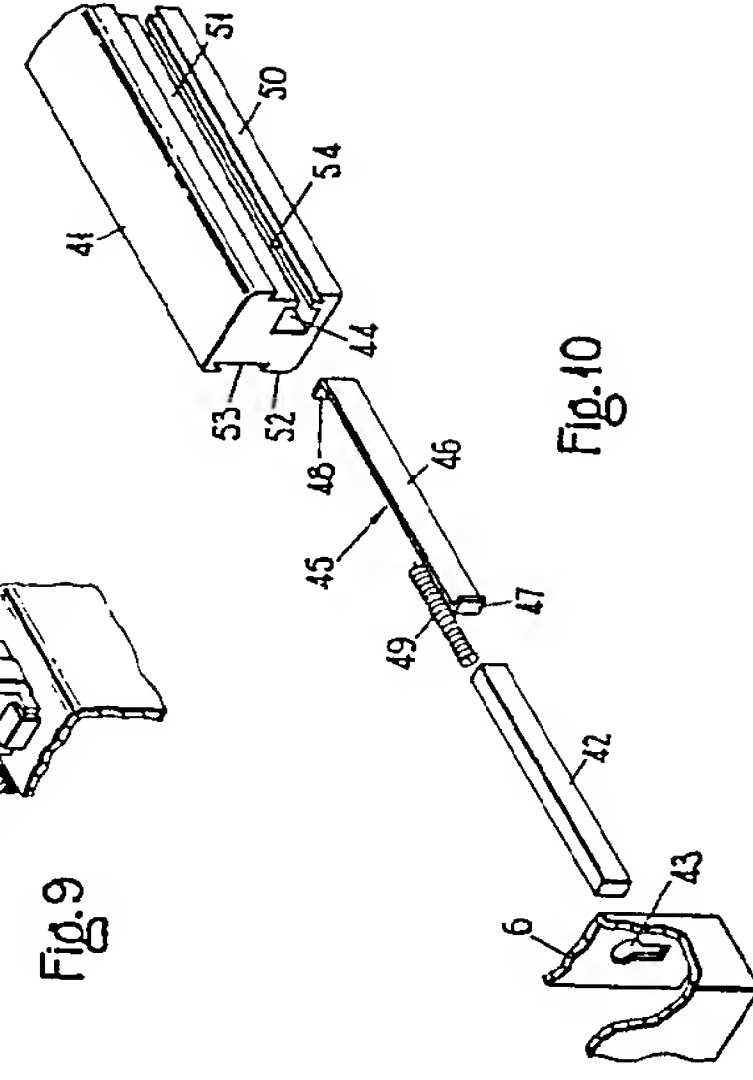


Fig. 10